NEW DATA ON THE DISTRIBUTION AND BIOLOGY OF *RHYNCHOGADUS HEPATICUS* AND *ERETMOPHORUS KLEINENBERGI* (OSTEICHTHYES: MORIDAE)

by

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ABSTRACT.- The capture of two adult specimens of *Rhynchogadus hepaticus* (Facciolà, 1884) and two of *Eretmophorus kleinenbergi* (Giglioli, 1889) (Osteichthyes: Moridae) in the Catalan Sea (northwestern Mediterranean) is reported. Some new aspects relative to the morphology, biology, geographic and bathymetric distributions of both species are described.

RÉSUMÉ. - Nous signalons la capture de quatre exemplaires adultes des espèces *Rhynchogadus hepaticus* (Facciolà, 1884) et *Eretmophorus kleinenbergi* (Giglioli, 1889) (Osteichthyes: Moridae) dans la mer Catalane (Méditerranée nordoccidentale). Les caractères morphométriques et méristiques des exemplaires sont détaillés et de nouvelles données sont apportées sur leur biologie et leur distribution bathymétrique et géographique.

Key-words. - Moridae, *Rhynchogadus hepaticus, Eretmophorus kleinenbergi,* MED, Catalan Sea, Geographical and bathymetric distributions, Biology, Morphometry.

During the "ZONAP 0592" cruise, whose principal objective was to obtain additional data on the deep sea fish assemblages of the Catalan Sea (northwestern Mediterranean), four individuals representing two rare and taxonomically puzzling species were captured: *Rhynchogadus hepaticus* (Facciolà, 1884) and *Eretmophorus kleinenbergi* (Giglioli, 1889). Although most authors accept these as valid species they have on some occasions been considered as possible early life-history stages of a known species or else neotenic forms (cf. Cohen, 1986).

They are of particular interest due to their rare occurrence and limited distribution restricted at present to certain sites in the northwestern Mediterranean.

The present paper aims to increase the existing knowledge of both species by providing new information on their geographic and bathymetric distributions, morphology and biological aspects.

MATERIAL AND METHODS

All the material studied was collected in the Catalan Sea (northwestern Mediterranean) during "ZONAP 0592" cruise (May 1992), on board B/O García del Cid. The geographical demarcation of this area as well as its main physical characteristics are summarized in Stefanescu *et al.* (1992).

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Samples were obtained with a semi-balloon otter trawl (OTSB14), trawled on the bottom with a single warp (cf. Rucabado *et al.*, 1991).

RHYNCHOGADUS HEPATICUS

Material examined

Rhynchogadus hepaticus (Fig. 1): one specimen (IIPB 57/1993), 50.0 mm total length (TL) [47.0 mm standard length (SL)], station St. 4 (40° 59.0'N - 01° 36.6'E), 427-431 m depth. One specimen (IIPB 58/1993), 55.4 mm TL (50.1 mm SL), station St. 30 (39° 16.3'N - 01° 25.8'E), 647-652 m depth.

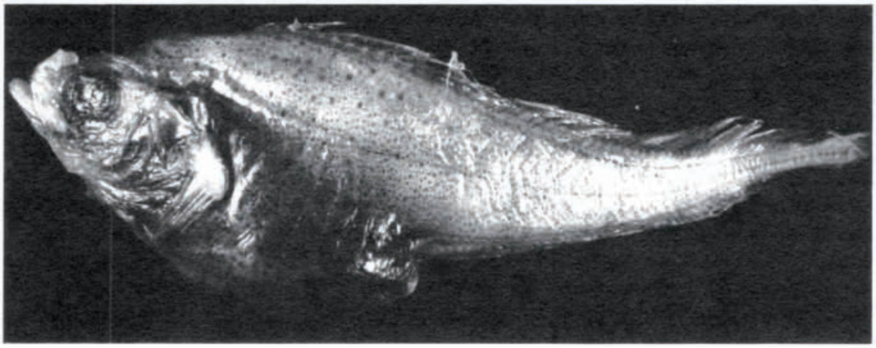

Fig. 1. - *Rhynchogadus hepaticus*, 47.0 mm SL, Catalan Sea IIPB 57/1993.

Diagnosis

Abdominal region enlarged (because the size of the liver); body depth (at the anus) 2.7 or 2.8 in standard length. Caudal peduncle very narrow. Second dorsal finrays 50-55; anal finrays 45-51; anal fin not indented. Colour: ventral finrays with no distal ornamentation. Body rather evenly pigmented, no pattern of bars or blotches (with minor modifications after Cohen, 1986).

Morphometry and meristics

Data presen0ted in table I.

Most of the material to date (cf. Bini, 1970) corresponds to juvenile stages between 4.3 mm and 30.0 mm TL. Development has been described (D'Ancona, 1933) for sizes 10.6 mm-30.0 mm. The largest specimen on record, the type, was 10 cm TL (Facciolà, 1884). Our specimens are of intermediate size.

Geographic and bathymetric distributions

The species is known from only a few localities in the western Mediterranean: the Messina Straits (Facciolà, 1884; Cipria, 1927, 1936), Tyrrhenian Sea (Ariola, 1904; Lo Bianco, 1911), Ligurian Sea (Tortonese, 1970) and Catalan Sea (Sabatés, 1987 and present data). Although considered endemic to the Mediterranean (Fredj and Maurin, 1987), the genus has, however, recently been recorded from the mid-Atlantic (Howes, 1991).

Table I. - Morphometric and meristic data of two specimens of *Rhynchogadus hepaticus* and two of *Eretmophorus kleinenbergi* captured in the Catalan Sea (northwestern Mediterranean).

	Rhynchogadus hepaticus				***Eretmophorus kleinenbergi***			
	1		2		1		2	
MORPHOMETRY	mm	% SL	mm	% SL	mm	% SL	mm	% SL
Total length	50.0	-	55.4	-	101.4	-	94.4	-
Standard length	47.0	100.0	50.1	100.0	88.9	100.0	87.7	100.0
Head length	14.0	29.8	12.2	24.4	18.2	20.5	16.4	18.7
Preorbital length	3.0	6.4	2.8	5.6	6.0	6.7	5.0	5.7
Base of 1st dorsal fin	3.5	7.4	-	-	4.0	4.5	-	-
Base of 2nd dorsal fin	29.4	62.6	-	-	63.4	71.3	-	-
Base of anal fin	21.1	44.9	-	-	55.3	62.2	-	-
Eye diameter	3.0	6.4	3.0	6.0	4.1	4.6	3.8	4.3
Interorbital distance	2.4	5.1	2.0	5.4	7.7	8.7	6.8	7.8
Body depth	16.0	34.0	18.9	37.7	23.5	26.4	20.8	22.8
MERISTICS								
Fin rays: 1st dorsal	4		4		4		4	
2nd dorsal	50		-		ca. 63		ca. 64	
Anal	45		-		ca. 63		ca. 63	
Pectoral	21		21		21		21	
Pelvic	7		7		5		5	
Gill rakers	20 (14+1+5)		18(13+0+5)		23 (16+7)		23 (16+7)	
Branchiostegal rays	7		7		7		7	
Piloric caeca	-		8		?		?	
Barbel on chin	present		present		present		present	
Catalogue number	IIPB 57/1993		IIPB 58/1993		IIPB 59/1993		IIPB 60/1993	

Bathymetric distribution is largely unknown. Even though many of the specimens taken off the Italian coast were caught in shallow waters, Lo Bianco (1911) suggested these were individuals carried off course by currents and considers the species to belong to the abyssal fauna.

Eggs (Cipria, 1936) and larvae in their first developmental stages are planktonic and are found at depths of less than 100 m (Sabatés, 1987). In the adult stage, *R. hepaticus* has been generally regarded as a bathypelagic species (cf. Bini, 1970; Cohen, 1986). The capture of two specimens at depths of 427-652 m using a bottom trawl suggests a possible benthopelagic behaviour.

The stomach content of one specimen was examined and found to be composed of large numbers of the copepod, *Calanus helgolandicus* and one example of *Candacia armata*. Prior data are from a specimen from Messina Straits, where the stomach content was a spherical mass consisting of large numbers of small crustaceans (Facciolà, 1884). *R. hepaticus* appears, therefore, to be a microphagous species feeding mainly on calanoid copepods. Although most of these copepods are typically pelagic, many appear regularly along the continental slope near the bottom (e.g., Marshall and Merrett, 1977; Hargreaves *et al.*, 1984).

Even though the exact bathymetric distribution of *C. helgolandicus* remains unknown, the species is an important component of zooplankton biomass in the shelf areas to the southwest of the British Isles (Williams and Conway, 1984) and also in northwestern Mediterranean waters (Scotto di Carlo *et al.*, 1984). In the Catalan Sea, *C. helgolandicus* shows important seasonal fluctuations and in May-June (when *R. hepaticus* individuals were captured) most of the populations are found between 500-1000 m (M. Carola, pers. comm.).

ERETMOPHORUS KLEINENBERGI

Material examined

Eretmophorus kleinenbergi (Fig. 2): one specimen (IIPB 59/1993), 101.2 mm TL (88.9 mm SL), station St. 22 (40° 50.9'N - 01° 39.0'E), 930-954 m depth. One (IIPB 60/1993), 94.9 mm TL (87.7 mm SL), station St. 25 (39° 24.5'N - 01° 16.1'E), 1141-1151 m depth.

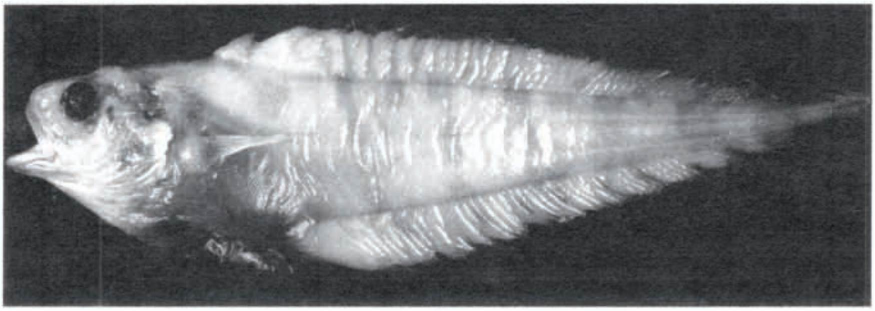

Fig. 2. - *Eretmophorus kleinenbergi*, 88.9 mm SL, Catalan Sea IIPB 59/1993.

Diagnosis

body depth (at the anus) 3.8 to 4.2 in standard length. Second dorsal finrays 63-77; anal fin not indented, with 63-74 rays; pelvic fins with several elongate rays, with some ornamentation distally (juvenile character), but without it in our specimens. Colour: body with a series of dusky transverse bars and dark blotches on dorsal and anal fins (with minor modifications after Cohen, 1986).

Morphometry and meristics

Data presented in Table I.

All known specimens have been in the size range 11.76 mm to 105 mm TL (cf. Bini, 1970). Development has been described by D'Ancona (1933) for sizes between 28 mm-105 mm TL.

A characteristic feature is the ventral fin structure. Of the five rays joined at the base by a membrane, three are well developed and possess a striking foliaceous appendage. In larger individuals appendages are present on the third and fourth rays (Bini, 1970). Our two specimens, which are in excellent conditions lack these appendages (Fig. 2). This suggests that the appendage is a characteristic of pre-metamorphic stages, as indicated by

Fahay and Markle (1984). Similar structures are typical in juvenile stages of many pelagic and demersal fish species (Kendall *et al.*, 1984). Therefore, this material does not support the hypothesis that *E. kleinenbergi* is actually the early stage of a known species or else a neotenic species (Lo Bianco, 1903; D'Ancona, 1933; Cohen, 1986; Paulin, 1989; Cohen *et al.*, 1990).

Although the only specimen larger (105 mm) than the two present individuals has its third and fourth ventral fin ray appendages well developed (cf. Mazzarelli, 1917), this does not necessarily contradict the above reasoning, as the loss of juvenile features does not always lead to an immediate size increase.

Geographic and bathymetric distributions

As with *Rynchogadus hepaticus*, *E. kleinenbergi* has been captured in only a few northwestern Mediterranean localities: Messina Straits (Giglioli, 1889; Mazzarelli, 1912, 1917), Tyrrhenian Sea (Mazzarelli, 1917; Tortonese, 1970), Ligurian Sea (Ariola, 1904; Tortonese, 1970) and Catalan Sea (present study). Although generally considered to be an endemic Mediterranean species (Fredj and Maurin, 1987), *Eretmophorus* has recently been reported from the mid-Atlantic (Howes, 1991).

The bathymetric distribution of *E. kleinenbergi* is virtually unknown. All specimens described in the literature have been caught in pelagic nets, and it is therefore considered an epipelagic species (cf. Cohen, 1986). Bini (1970) presents a depth range between 30 and 500 m. The capture of our two specimens with a bottom trawl was done at depths between 930 and 1151 m. As seems likely, they were not caught in midwater, widening its depth range considerably and suggesting demersal behaviour for the sampled sizes, which may be considered as post-metamorphic individuals. Further clarification by examination of food was impossible as the stomachs were empty.

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